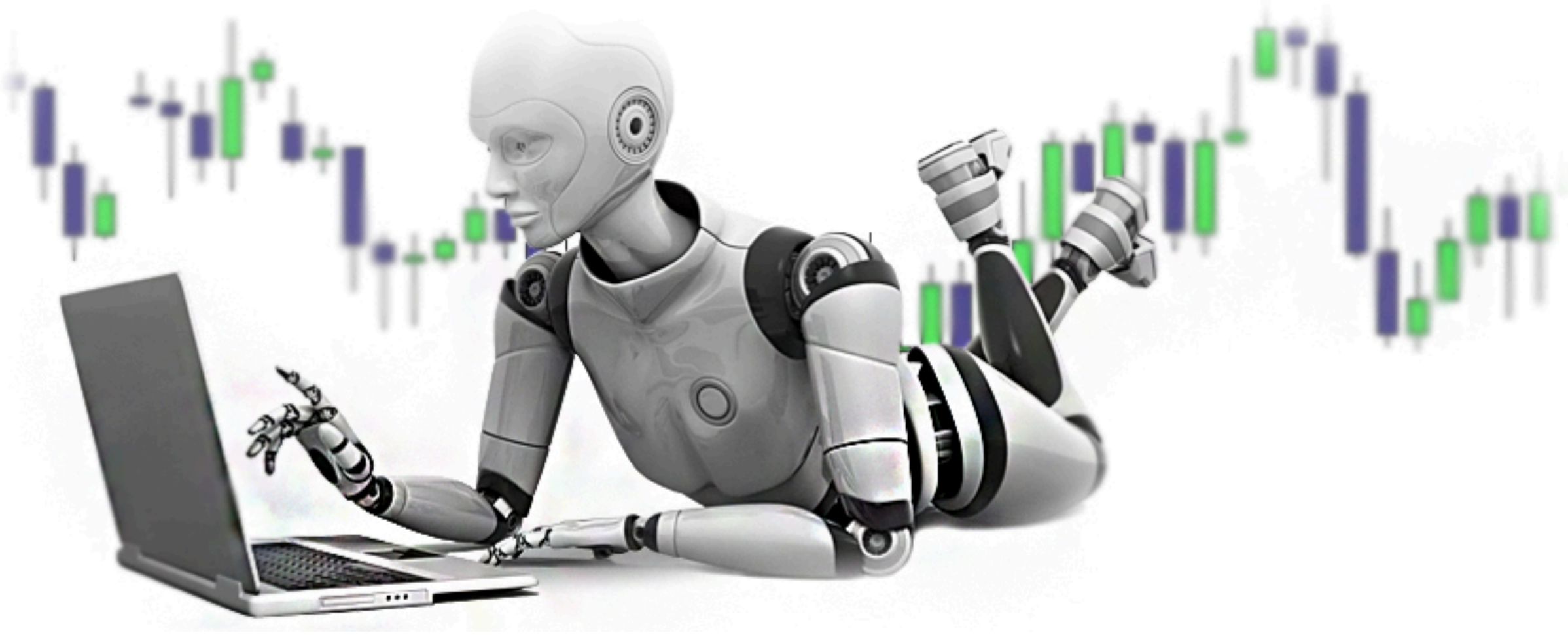
Lua by the eyes of a Perl developer

Ilya Chesnokov

Prehistory

I have a friend

Once upon a time he asked me to write a trading bot...



...in Lua

That time I only knew
that Lua has a nice community
:-)

Lua is...

Fast

Lua is...

Fast

Portable

Lua is...

Fast

Portable

Embeddable

Lua is...

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Small

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Powerful (but simple)

Embeddable

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Embeddable

Free

Can be learned
in virtually no time!

Sounds nice, right?

Let's learn it!

The Book

AllPerlBooks.com

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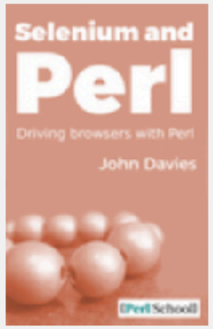

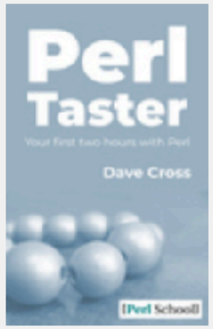

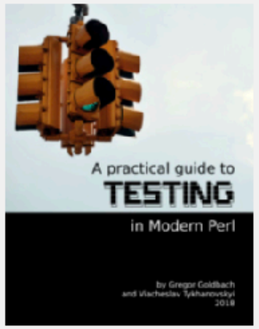

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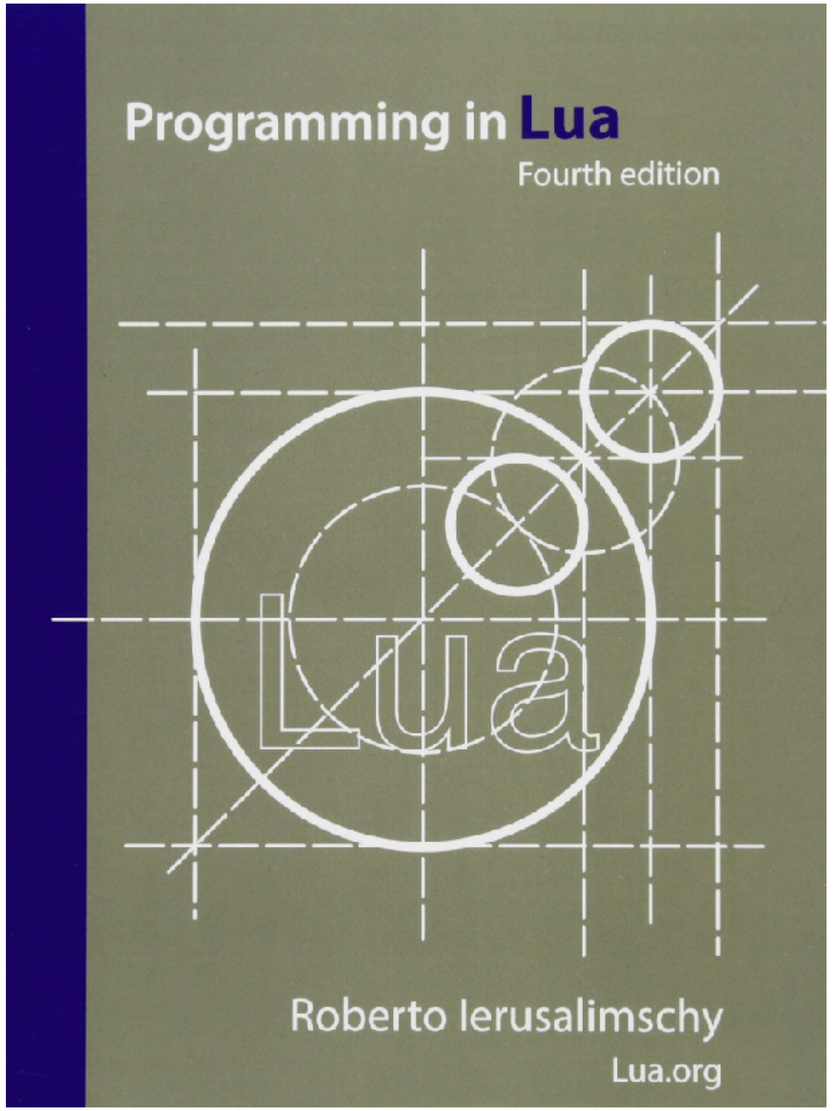
Lua


Programming in Lua
Fourth edition
Lua
Roberto Ierusalimschy
Lua.org

Programming in Lua (the book)

- 1st edition - Lua 5.0
- 2nd edition - Lua 5.1
- 3nd edition - Lua 5.2
- 4th edition - Lua 5.3

What version to learn / use?

Lua 5.x versions

- Lua 5.0 (Apr 2003)
- Lua 5.1 (Feb 2006)
- Lua 5.2 (Dec 2011)
- Lua 5.3 (Jan 2015)

LuaJIT (5.1-compatible)

LuaJIT primary changes

- JIT compiler (overall much faster than Lua 5.1)
  - With controllable behavior
- Bit library
- FFI library
- C API extensions

Perl 6 - the ideal from the future

Perl 6 - the ideal
from the future

LuaJIT - the ideal
from the past

Lua 5.2 primary changes

- **goto** statement
- New library for bitwise operations
- "Official" support for table finalizers
- _ENV variable

Lua 5.3 primary changes

- Integers
- Bitwise operators
- Basic UTF-8 support
- Functions for packing and unpacking values

Lua is NOT backward compatible!

Always check
your target environment!

Getting the interpreter

Requirements:
Lua + LuaRocks

*nix:
use package manager

MacOS X:
homebrew

Windows:
it's complicated

Official site (manual installation)

- lua.org - Lua interpreter
- luarocks.org - LuaRocks package manager
  - "make" command: cmake.org
  - C compiler: MSVC, MinGW or **TDM-GCC**
  - Have to adjust linker configuration for MSVCRT or MinGW
  - Conflicts with Strawberry Perl utils in your path (or I failed to configure)

Automated installation

- luadist.org - "batteries included" distribution
  - Good documentation of installation process for Windows users
  - Fails to compile / install some versions of Lua

Automated installation

- LuaForWindows - another "batteries included" environment
  - Lua 5.1 only

Automated installation

- hererocks - Python script for installing Lua(JIT) and LuaRocks
  - Requires Python
  - Suitable for other OS'es

LuaRocks ships Lua 5.1

LuaRocks ships Lua 5.1 (you still need make & C)

Useful tools

Editors

- Zero Brain Studio - for Windows
  - Only supports UTF-8 text

Editors

- Zero Brain Studio - for Windows
  - Only supports UTF-8 text
- Many others
  - I ended up with Vim + Lua plugins

LuaFormatter simplistic analog of PerlTidy for Lua

luacheck
static analyser / linter

luacheck

- Detects
  - undefined global variables
  - unused variables and values
  - unreachable code
  - ...etc

luacheck

- Similar to **perlcritic**
- "Must have" in your Lua test suite

Lua syntax

Blocks

- Block - list of statements, executed sequentially
- Explicitly delimited block:

do block **end**

Chunks

- Unit of compilation of Lua
  - can be precompiled into binary form and stored
- Syntactically it's a block
- Semantically it's an anonymous function
  - can have arguments
  - can return values

Variables: global and local

```
a = 1          -- global variable, visible everywhere,
               -- slow access
```

Variables: global and local

```
a = 1           -- global variable, visible everywhere,
                -- slow access

local x         -- local variable,
                -- only visible in the current block,
                -- fast access
```

Strings

```
'abcd'      -- single line only, no interpolation

"ab\ncd"    -- single line only, interpolates
            -- escape sequences (\n, \t, etc)

[[abcd
efgh]]      -- multiline, no interpolation

[=[abcd
efgh]=]     -- same thing
```

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String concatenation: ..

```
'abcd' .. '123' == 'abcd123'
```

Comments

```
-- This is a one-line comment

--[[ This is
a multiline comment ]]

--[==[ This is
       also a multiline comment ]==]
```

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Numbers

```lua
1.0 -- double precision floating point number

1   -- integer (since Lua 5.3)
```

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Comparison operators

```
x == y -- x is equal to y

x ~= y -- x is not equal to y
```

Nil

Nothing, the absence of any useful value

Booleans

```
true   -- true

false  -- false

nil    -- false

''     -- true

0      -- also true
```

Functions

```
function hello(name)
  print('Hello, ' .. name)
end
```

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function hello(name)
  print('Hello, ' .. name)
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local hello = function(name)
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end

local function hello(name)
  print('Hello, ' .. name)
end
```

Tables

- The sole data-structuring mechanism in Lua
- Represents ordinary arrays, hashes and other data structures
- Values of fields can be anything besides **nil**

Tables

```lua
-- ordinary array
local array = {'foo', 'bar', 3, 7, 'baz', 9}
```

Tables

```lua
-- ordinary array
local array = {'foo', 'bar', 3, 7, 'baz', 9}

-- associative array
local hash = {
   ['foo'] = 'bar',
   [1]     = 'one',
   baz     = 9,
}
```

Accessing table fields

```lua
local array = { foo = 'bar', [500] = 'baz' }

print(array.foo)   -- bar
print(array[500]) -- baz
```

Interesting facts

- Array indexing starts **with 1**

Interesting facts

- Array indexing starts **with 1**
- Lua implements "sparse" arrays

Sparse arrays

```perl
# Perl array
my @values;
$values[999_999] = 1; # 1M elements, a lot of RAM
```

```lua
-- Lua array
local values = {}
values[999999] = 1 -- 1 element, tiny piece of RAM
```

Array length operator: "#"

Array length operator: "#" (borrowed from Perl's "$#" ???)

Array length operator: "#"

```lua
local chars = { 'a', 'b' }
print(#chars)    -- 2
```

Array length operator: "#"

```lua
local chars = { 'a', 'b' }
print(#chars)    -- 2

chars[4] = 'd'   -- chars: { 'a', 'b', nil, 'd' }
print(#chars)    -- Not determined: 2 or 4
```

Metatables and metamethods

Metatables and metamethods

```
local MyMetaTable = {
    -- ...metamethods declaration...
}

local my_table = {}
setmetatable( {}, MyMetaTable )
```

Metamethods

- Arithmetic: __add, __sub, __mul, __div, ...
- Comparison: __eq, __lt, __le
- String: __concat
- Array: __len
- Function: __call
- Table: __index, __newindex
- Garbage collection: __gc

Metamethods

- Arithmetic: __add, __sub, __mul, __div, ...
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Tables and environment

- _ENV - table with environment specific for the chunk (defaults to _G)
- _G - table with global environment
  - Contains global variables and functions
- Modules are typically implemented as tables

Lua syntax difficulties

No explicit ternary operator

Make it up:

result = expr **and** do_if_true() **or** do_if_false()

Poor regular expressions

- Can install PCRE library
- Or install and learn LPeg - Parsing Expression Grammars for Lua
- (Both need C compiler)

"return" always goes last

Use:

do return **end**

func '...' or func { ... } only

```
print "hi"                    -- OK
dump { a = 1, b = 2 }  -- OK

print name                    -- NOT OK
```

Lua syntax benefits

- It has a BNF
- Some constructs are optional: semicolons, parens
- Easy to learn due to its simplicity

Modules

Writing a module

Point.lua

```
Point = {}

function Point.new()
  return { x = 0, y = 0 }
end

function Point.move(point, dx, dy)
  point.x = point.x + dx
  point.y = point.y + dy
end

return Point
```

Point.lua

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local Point = {}

function Point.new()
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end

function Point.move(point, dx, dy)
  point.x = point.x + dx
  point.y = point.y + dy
end

return Point
```

Point.lua

```lua
local M = {}

function M.new()
  return { x = 0, y = 0 }
end

function M.move(point, dx, dy)
  point.x = point.x + dx
  point.y = point.y + dy
end

return M
```

Point.lua

```
return {

  new = function()
    return { x = 0, y = 0 }
  end,

  move = function(point, dx, dy)
    point.x = point.x + dx
    point.y = point.y + dy
  end

}
```

Loading a module

require(modname)

- Checks **package.loaded** table to determine if module is already loaded
- Loads the given module
- By default, uses paths from
  - **package.path** - Lua modules
  - **package.cpath** - compiled C modules for Lua

package.path

- Is taken from **LUA_PATH_5_3**, **LUA_PATH**, or default from **luaconf.h**
- Typically something like:
  - /usr/share/lua/5.3/?.lua;/usr/share/lua/5.3/?/init.lua;./?.lua

```
package.path =
    '/usr/share/lua/5.3/?.lua;'
.. '/usr/share/lua/5.3/?/init.lua;'
.. './?.lua'
```

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```

package.path

```lua
package.path = './?.lua'

require('SomeModule')      -- ./SomeModule.lua

require('My.Nice.Module') -- ./My/Nice/Module.lua
```

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OOP in Lua

Lua is not an OO language...

Lua is not an OO language...
...but tables are for the rescue!

__index metamethod

- Happens when **table[key]** is queried for nonexistent **key**
- Value can be:
  - a function
  - or a table where **key** is looked up

__index metamethod

```lua
local MyClass = {
   __index = {
      x = 'foo',
      y = 10,
   }
}

local obj = setmetatable( {}, MyClass )
print( obj.x ) -- 'foo'
```

Point.lua

```lua
local Point = {}

function Point.new()
  return { x = 0, y = 0 }
end

function Point.move(point, dx, dy)
  point.x = point.x + dx
  point.y = point.y + dy
end

return Point
```

Point.lua

```lua
local Point = {}
Point.__index = Point

function Point:new()
  return setmetatable({ x = 0, y = 0 }, Point)
end

function Point:move(dx, dy)
  self.x = self.x + dx
  self.y = self.y + dy
end

return Point
```

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local Point = {}
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  self.y = self.y + dy
end

return Point
```

use_point.lua

```lua
local Point = require('Point')

local p1 = Point:new()
print(p1.x, p1.y) -- 0, 0

p1:move(10, 20)
print(p1.x, p1.y) -- 10, 20

local p2 = Point:new()
print(p2.x, p2.y) -- 0, 0
```

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```

Common OOP techniques

- Inheritance: use another class as a metatable
- Multiple inheritance: use function as the value of __index
- Private fields / methods: use local variables / functions

Destructors

```
sub foo { say 'original sub ' }
foo();          # original sub

{
    my $token = Sub::Override->new(
        foo => sub { say 'overridden sub' },
    );
    foo();      # overridden sub
}

# $token goes out of scope...
foo();          # original sub
```

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sub foo { say 'original sub ' }
foo();          # original sub

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    );
    foo();      # overridden sub
}

# $token goes out of scope...
foo();          # original sub
```

__gc metamethod

It is called before the actual garbage collection happens

```lua
function foo()
  print('original sub')
end
foo() -- original sub

do
  local token = SubOverride:new({
    foo = function()
      print('overridden sub')
    end
  })
  foo() -- overridden sub
end

foo() -- overridden sub (WTH?!)
```

```
function foo()
  print('original sub')
end
foo() -- original sub

do
  local token = SubOverride:new({
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    end
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  foo() -- overridden sub
end

foo() -- overridden sub (WTH?!)
```

The execution of each finaliser
may occur at any point
during the execution of the regular code

Destructors are complicated!

OOP frameworks

OOP frameworks

- lua-Coat - A port of Perl's Coat, Moose-like OOP framework

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- 30log - Single-file module, full-featured OO in 30 lines of code
- MiddleClass - OO module with inheritance, mixins (roles), class variables, etc

And many more

lua-users.org/wiki/
ObjectOrientedProgramming

Standard library

Standard library

- Basic functions
- coroutine
- package
- string
- utf8
- table
- math
- io
- os
- debug

Standard library in Perl:
~200 modules in v5.26.1

Need more modules?

LuaRocks.org

Unofficial Lua module repository

Much fewer modules
than on CPAN :-((

find file Search

File::Find - Traverse a directory tree. 313 ++

These are functions for searching through directory trees doing work on each file found similar to They work similarly but have subtle differences. find find(\&wanted,...

XSAWYERX/perl-5.28.0 - Jun 23, 2018 - Search in distribution

- File::Find - Traverse a directory tree.
- O - Generic interface to Perl Compiler backends
- O - Generic interface to Perl Compiler backends

249 more results from perl »

File::Find::Age - mtime sorted files to easily find newest or oldest ++

JKUTEJ/File-Find-Age-0.01 - Jun 30, 2012 - Search in distribution

File::Find::Rex - Combines simpler File::Find interface with support for regul

This module provides an easy to use object oriented interface to "File::Find" and adds the ability t

* Find results returned as array or via a callback subroutin...

ROLANDAY/File-Find-Rex-1.00 - Jan 24, 2018 - Search in distribution

File::Find::Node - Object oriented directory tree traverser ++

The constructor File::Find::Node->new creates a top level File::Find::Node object for the specifiec for each item in the traversal. The $f->post_process method takes...

Search

Query find file

Include non-root ☐

Search

Modules

love-ora by clofresh — downloads: 75

A library for loading OpenRaster files into LÖVE games.

Users

findstr

filerhvm

Don't see what you expect? Give feedback on our issues tracker

Google for "Lua find file"

- Links to various game engine APIs
- Suggestions to write it manually
- And finally, a link to **lua-users** wiki page `with source code of directory iterator function!!!`

Why wasn't it released as a Luarocks module?!

Other sources of reusable code

- Lua users wiki: lua-users.org
- Github & friends
- "All in one" library collections:
  - Independent collections: Penlight
  - Product- or framework-based: OpenResty, Tarantool, Corona, Love2D, ...

Copy & paste is encouraged (implicitly)

Module names are incosistent

- luarocks install **lua-TestMore** <-> require 'Test.More'
- luarocks install **luafilesystem** <-> require 'lfs'

Documentation

No POD
(or any replacement)

luarocks doc <package>

- "Tries to load the documentation using a series of heuristic"
  - Looks for project homepage using rock specification
  - Looks for file named like:

/ (index|readme|manual) ([.] (html?|txt|md|textile)?) /xi

Documentation is not displayed at luarocks.org

You have to host docs separately

- github.com & friends
- Documentation platforms: readme.io, readthedocs.io, etc
- Maintainers' websites (often broken)

Unit testing

Place of testing
in Lua infrastructure

Tests for Lua interpreter

- Don't run when you install it from source
- They are not even in the same repository

Tests during module installation

- **luarocks** doesn't try to run them
  - You're not encouraged to write tests

"Testing" section in PiL book

- Is absent
- (Also, it doesn't mention **luarocks**)

lua-users.org/wiki/UnitTesting

Lua unit testing frameworks

- Busted - BDD unit testing library, produces different outputs (TAP included)
- LuaUnit (Lua 5.2 and below only)
- lua-TestMore (yes, Perl-style testing!)

I wrote my own

I wrote my own
github.com/ichesnokov/lua-TestClass

I wrote my own
github.com/ichesnokov/lua-TestClass
#quickndirty #WIP #usablethough

Community

Communication methods

- lua-l mailing list - primary way of communication
- Several IRC / Telegram channels
- Local user groups / meetups

Source: lua.org/community.html

User groups

- 2-3 in Europe - London, Moscow, Paris (?)
- 2 in the US

Source: lua-users.org/wiki/UserGroups

Conferences / meetups

- Local meet-ups
- Lua devroom at FOSDEM (sometimes)
- Lua Conference - typically in Portuguese
- Lua Workshop - yearly event, typically in English
  - Next one: 7-8 Sep 2018 in Kaunas, Lithuania

Talks at general-purpose or gamedev conferences

Communities around products that support Lua

There are many of them!

Community overall:
Friendly, supportive
and lots of fun

Conclusions

Do not treat Lua
as a general-purpose language!

"Scripting" and "embeddable" words are not just a sound!

Help Lua!

- Learn it
- Release a module or two (or three) to LuaRocks
  - maybe port some Perl library
- Come to Lua conference/meetup, make a talk

Let Lua help you!

Let Lua help you!
Use it in your project maybe?

Have fun!

And yeah, I created a bot!

And yeah, I created a bot!
It even (mostly) worked!

(not really)

Questions?

Thank you!